

4.0 RISKS TO HUMAN HEALTH & THE ENVIRONMENT

The following discussion of exposure pathways, exposure points, and receptors identifies possible means and locations where human or ecological receptors may come in contact with PCB-contaminated media now or in the future. The purpose of the exposure pathway/receptor evaluation is to:

- Assess potential risks and establish remedial actions needed at the Site.
- Provide a basis for establishing cleanup levels. That is, determining levels of constituents that can remain in the sediments and still be adequately protective of human health and the environment.

An exposure pathway is a link between a contaminant source and an exposed receptor (human, animal, plant, etc.). A complete exposure pathway must include all of the following:

Source and mechanism for release

Transport medium

Receptor at an exposure point

Route of uptake (ingestion, inhalation, dermal contact).

Ecology's recommended cleanup actions will protect people and ecological receptors under all probable exposure scenarios. Cleanup levels will be based on the most current standards that are being recommended for the protection of human health and the environment.

4.1 Ecological Receptors & Environmental Concerns Relative to PCBs

The primary potential ecological receptors of PCBs in surface water and sediment in the vicinity of Upriver Dam are: 1) species that live in the Spokane River bottom sediments that have contact with or ingest the river sediments and/or river water; 2) species that live in the river; and 3) species that ingest surface water and organisms from the river.

Potential environmental risks and receptors of concern identified to date for PCBs present in the Upriver Dam area have included the following:

- Potential mobilization into the water column and impacts to water quality
- Potential for localized toxicity (i.e., in areas exceeding sediment screening level concentrations) to sediment-dwelling (benthic) invertebrate organisms (Johnson 2001)
- Potential contributions to fish body burdens of PCBs resulting in decreased fitness and fecundity
- Potential risks to wildlife (e.g., birds and mink) and human health due to PCB uptake and bioaccumulation (Johnson 2001)

4.2 Human Receptors & Exposure Pathways

The pathways of human exposure to the PCBs found on the Site vary according to the specific location within the Site. There are two potential exposure pathways that were identified for people who frequent the Site: PCB exposure through ingestion and dermal contact. The human exposure pathway to PCBs associated with the Site is dietary through fish consumption. A second potential dermal exposure pathway was also considered for people who might come in contact with PCBs in the water column and/or sediments at the Site. This pathway was

determined to be insignificant and/or unlikely. The environmental concerns associated with PCBs and human-exposure scenarios are explained in more detail below.

4.2.1 Surface Water

The primary route of human exposure along the length of the Site and in other stretches of the river is through the ingestion of PCBs accumulated in fish. Elevated PCB exposure and risks exist to people who consume fish caught in the Spokane River. Consumption of fish inhabiting and/or feeding throughout the Site and upper river may have detrimental health effects on people and higher level predators. PCBs accumulate in fatty tissue of fish and other organisms that come in contact with them through surface water or through ingestion of other aquatic species accumulating PCBs via the benthic food web. In turn, these PCBs are passed to other organisms higher on the food chain. The end result is high levels of PCBs in the fish species frequently consumed by anglers and their families. PCBs can also be passed from mothers who eat PCB-contaminated fish to infants by breast feeding. Exposure to PCBs either through direct or secondary ingestion of contaminated fish can have both short-term and long-term health consequences.

Ecology and the WA Department of Health, in conjunction with the Spokane Regional Health District, issued a fish consumption advisory due to elevated fish tissue lead concentrations. Further testing of fish caught in the upper Spokane River confirmed the presence of elevated levels of PCBs in rainbow trout, mountain whitefish, and large scale suckers. The advisory was updated in 2001 to reflect the results of PCB tissue analysis of fish taken from, or in the vicinity of, the Site and the greater risks posed by PCBs. The public was advised to avoid eating any rainbow trout or mountain whitefish caught in the Spokane River above the Upriver Dam to the Idaho state line primarily due to PCBs. The advisory also recommended limitations on eating meals of large scale suckers. Pregnant women, as well as families with small children, were informed of the detrimental developmental effects associated with ingesting PCBs and heavy metals at levels found in the three species of fish. The toxicological affects of exposure are cumulative, and cancer risks increase with continued exposure to PCBs. PCBs can also have detrimental human health effects other than cancer including liver damage, skin irritation, neurotoxicity, immune and reproductive system suppression. Potential changes in fish tissue concentrations since 2001 is expected to be evaluated through additional future sampling.

4.2.2 Sediments

The primary potential pathway of exposure to human receptors of PCBs in sediments in the vicinity of Upriver Dam is the consumption of fish species that may have accumulated PCBs as a result of water column and/or benthic food web uptake. The potential for dermal exposure may potentially occur in the backwater area of Deposit 2, Donkey Island, due to the accessibility of the PCB-contaminated sediments in the shallow backwater areas of that area. The proximity of the contaminated area to the Centennial Trail also increases the likelihood of dermal exposure to the sediments and porewater in the Donkey Island channels. The potential toxicological consequences of dermal exposure to PCBs, through either contact with contaminated sediment or the surface water at the Site, are similar to those discussed above for ingestion of PCB-contaminated fish. Remedies selected and described by this decision document reduce or eliminate the potential for dermal exposure to toxic concentrations. PCB-contaminated sediments will be removed in areas where containment and isolation is infeasible or less protective.

4.2.3 Groundwater

The primary potential pathway of exposure to human receptors of PCBs in groundwater in the vicinity of Upriver Dam is groundwater consumption. Groundwater beneath the Spokane River near Upriver Dam occurs in the Spokane Valley-Rathdrum Prairie "Sole Source" Aquifer that serves as the drinking water supply for at least 400,000 people in Spokane County. In the vicinity of the Upriver Dam impoundment, surface water generally flows from the impoundment into the groundwater; however, a regional westward groundwater flow with discharge to the river appears to be restored within approximately one-half to one mile downstream from the dam. As discussed in Section 3.3, maximum PCB concentrations in groundwater in the Upriver Dam area are well below the MTCA groundwater cleanup levels and are approximately three orders of magnitude below the current drinking water maximum contaminant levels. Further, the existing domestic and public water supply wells near the river do not draw water wholly derived from Upriver Dam, providing for additional mixing and attenuation. For these reasons, consumption of groundwater containing detectable PCBs from river water associated with the Upriver Dam impoundment is an insignificant exposure pathway.